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NEW METHOD FOR CALCULATION OF SERVICE CAPACITIES AND FEEDERS.

For some three years a special sub-committee appointed by the Committee on Part I of the Canadian Electrical Code has been studying the subject of demand factors. This Committee has developed an entirely new method of calculating service capacities and feeders based on field data gathered from across Canada.

The final proposal on this subject was submitted to the last meeting of the Part I Committee and adopted at that time for inclusion in the 7th Edition of the Code.

In adopting this proposal the Part I Committee also agreed on three Code revisions associated with the new method of calculating service capacities and feeders but not specifically indicated in the following draft. The first of these revisions involves Rule 6-040 (a) of the 6th Edition, which will be changed to require main service protection in all cases. The second Rule concerned is 12-258 which will be altered to limit the number of outlets on a two-wire branch circuit to eight when any convenience receptacles are connected to the circuit. If no convenience receptacles are involved, a maximum of twelve outlets may be installed as permitted at present. Thirdly, the present reduction in wattage requirements permitted where fluorescent lighting is installed will not be allowed when services and feeders are based on the new proposal.

Where desired, installations may be based on the new proposal from this date but it is to be emphasized that when the services and feeders required are calculated according to the new proposal, the revisions outlined above must be complied with in all cases.

During the interim period from the present time until the 7th Edition of the Canadian Electrical Code is published, the requirements for main service protection will in general continue to be those currently in effect. That is, main service protection will not be required for installations made in accordance with the previously revised Rule 6-040 (a), as published in the Quarterly Bulletin of April, 1954, and where the service and feeder capacities are based on existing Code requirements. It is, however, anticipated that main service protection will become mandatory for all installations made under Rule 6-040 (a) upon publication of the 7th Edition of the Canadian Electrical Code.

Following is a general outline of the new method for calculating service and feeder capacities.

CIRCUIT LOADING AND DEMAND FACTORS.

4-046 - Scope.

The circuit capacity requirements of Rules 4-048 to 4-070 shall be used to calculate the conductor sizes necessary for services, and for feeders and branch circuits except those specifically covered by other Rules of this Code.

4-048 - General.

(1) Since the use of demand factors less than 100 percent has the effect of reducing the size of conductors that would be otherwise required, the size of conductors and switches computed in accordance with Rules 4-048 to 4-070 shall be the minimum used except that, if the next smaller standard size in common use has a current-carrying capacity not more than 5 percent less than this minimum, the inspection department may, at its discretion, permit the use of the smaller size.

(2) In any case where the design of an installation is based on requirements in excess of those given in Rules 4-048 to 4-070, the service and feeder capacities shall be increased accordingly.

4-050 - Single Family Residences.

(1) The minimum current-carrying capacity of service conductors shall be based on the following:

(a) A basic load of:
- (i) 3500 watts for a residence having up to and including 500 square feet of living area; or
- (ii) 4500 watts for a residence having more than 500 square feet but not more than 1500 square feet of living area; and
- (iii) an additional 1000 watts to be added for each 1000 square feet or portion thereof by which the living area exceeds 1500 square feet; and

(b) Additional loads, when provided for, of:
- (i) 6000 watts for a range of 12 kw or less;
- (ii) 6000 watts plus 25 percent of the rating in excess of 12 kw for a range of more than 12 kw;
- (iii) 25 percent of the rating of any additional loads with ratings in excess of 1500 watts if a range is provided for;
- (iv) 100 percent of the rating of any additional loads individually exceeding 1500 watts, up to a total of 6000 watts and 25 percent of the rating in excess of a total of 6000 watts if a range is not provided for; but

(c) When a range or dryer is to be provided for, the current-carrying capacity shall in no case be less than 50 amperes.

(2) The current-carrying capacity of branch circuit conductors shall be as required by this or other Sections of the Code for the specific type of load supplied by the branch circuit.

4-052 - Apartments, Motels, and Other Multi-Family Residences.

(1) The current-carrying capacity of service or feeder conductors supplying loads in individual residential units shall comply with Rule 4-050 (1).

(2) The current-carrying capacity of main service conductors supplying two or more residential units shall be based on the following minimum loading:

(a) If space heating is not used, the total load shall be considered to be:

(i) 65 percent of the sum of the loads in the two units having the heaviest loads; plus
(ii) 25 percent of the sum of the loads in the next 18 units; plus
(iii) 10 percent of the sum of the loads in the remaining units.

(b) If space heating is used, the total load shall be considered to be:

(i) 70 percent of the sum of the loads in the two units having the heaviest loads; plus
(ii) 35 percent of the sum of the loads in the next 18 units; plus
(iii) 10 percent of the sum of the loads in the remaining units.

(c) In addition, any heating and power loads not located in individual units shall be added with a demand factor of 75 percent.

(3) The current-carrying capacity of a feeder supplying two or more electric range branch circuits shall be based on Rule 4-068.

4-054 - Schools.

(1) The current-carrying capacity of service conductors shall be based on the following minimum loading:

(a) A basic load of 3 watts per square foot of classroom area plus 1 watt per square foot of the remaining area of the building based on the outside dimensions; plus
(b) Heating and power loads based on the rating of the equipment installed; except that
(c) A demand factor of 75 percent may be applied to the total load for buildings with an area up to and including 10, 000 square feet based on the outside dimensions; or

(d) A demand factor of 50 percent may be applied to the total load for buildings with an area exceeding 10,000 square feet based on outside dimensions provided that the estimated loading so calculated is not less than that which would be required for the same connected load in an area of 10,000 square feet.

(2) The current-carrying capacity of feeder conductors shall be based on the following minimum loading:

(a) A basic load of 3 watts per square foot of classroom area plus 1 watt per square foot of any additional area, served by the feeder; plus
(b) A current-carrying capacity sufficient for any heating or power loads.

(3) The current-carrying capacity of branch circuit conductors shall be as required by this or other Sections of this Code for the specific type of load supplied by the branch circuit.

4-056 - Hospitals.

(1) The current-carrying capacity of service conductors shall be based on the following minimum loading:

(a) A basic load of 1 watt per square foot of the area of the building based on the outside dimensions; plus
(b) 10 watts per square foot for high intensity areas, such as operating rooms; plus
(c) Heating and power loads based on the rating of the equipment installed with:
  (i) a demand factor of 75 percent for buildings with a total area up to and including 10,000 square feet, based on the outside dimensions; or
  (ii) a demand factor of 50 percent for buildings with a total area exceeding 10,000 square feet provided that the estimated loading so calculated is not less than that which would be required for the same connected load in an area of 10,000 square feet.

(2) The current-carrying capacity of feeder conductors shall be based on the following minimum requirements:

(a) A basic load of 1 watt per square foot of the area plus 10 watts per sq. foot of any high intensity lighting area, served by the feeder; plus
(b) A current carrying capacity sufficient for any heating or power loads.

(3) The current-carrying capacity of branch circuit conductors shall be as required by this or other Sections of this Code for the specific type of load supplied by the branch circuit.

4-058 - Hotels, Dormitories and Buildings of Similar Occupancies and Demands.

(1) The current-carrying capacity of service conductors shall be based on the following minimum loading:

(a) A basic load of 1.5 watts per square foot of the area of the building based on the outside dimensions; plus
(b) Lighting loads for special areas such as Ballrooms, etc., with a demand factor of 100 percent; plus
(c) Heating and power loads based on the rating of the equipment installed with:
  (i) a demand factor of 75 percent for buildings with a total area up to and including 10,000 square feet based on the outside dimensions; or
  (ii) a demand factor of 50 percent for buildings with a total area exceeding 10,000 square feet provided that the estimated loading so calculated is not less than that which would be required for the same connected load in an area of 10,000 square feet.

(2) The current-carrying capacity of feeder conductors shall be based on the following minimum loading:

(a) A basic load of 1.5 watts per square foot of the area served by the feeder; plus
(b) Lighting loads for special areas such as Ballrooms, etc., served by the feeder, with a demand factor of 100 percent; plus
(c) A current-carrying capacity sufficient for any heating or power loads.

(3) The current-carrying capacity of branch circuit conductors shall be as required by this or other Sections of this Code for the specific type of load supplied by the branch circuit.

4-060 - Other Types of Occupancy.

(1) The current-carrying capacity of service conductors shall be based on the following minimum loading:

(a) A basic load to be calculated on the basis of wattage per square foot required by Table 14 with application of demand factors as indicated therein; plus
(b) Heating and power loads based on the rating of the equipment installed with such demand factors as are permitted by this Code for the specific types and number of equipments.

(2) The current-carrying capacity of feeder conductors shall be based on the following minimum loading:

(a) A basic load to be calculated on the wattage per square foot required by Table 14 for the area served by the feeder; plus

(b) A current-carrying capacity sufficient for any heating or power loads.

(3) The current-carrying capacity of the branch circuit conductors shall be as required by this or any other Section of this Code for the specific type of load supplied by the branch circuit.

4-062 - Special Lighting Circuits.

Where a panel is supplying special types of lighting, such as exit lights or emergency lights which may be located throughout the building so that it is not possible to calculate the area served, the connected load of the circuits involved shall be used in determining a feeder size.

4-064 - Minimum Number of 15 Ampere Branch Circuits.

The minimum number of 15 ampere branch circuits to be provided for in an installation shall be calculated on the basis of a maximum loading of 12 amperes for each such circuit.

4-066 - Currents Based on Wattage Requirements.

When calculating currents which will result from wattages to be supplied by a single phase system the voltage divisors to be used shall be either 115 or 230.

4-068 - Conductors Supplying Electric Ranges.

(1) Conductors of a branch circuit supplying one domestic range or of a feeder supplying two or more domestic ranges shall be considered as having a demand load as follows:

(a) For ranges having a rating of 12 kw or less, the demand load is:
  (i) For 1 to 5 ranges, 5 kw plus 3 kw per range;
  (ii) For 6 to 40 ranges, 15 kw plus 1 kw per range;
  (iii) For more than 40 ranges, 25 kw plus 3/4 kw per range, as shown in Table 15.

(b) For ranges having a rating of more than 12 kw but not more than 21 kw, the demand load is that indicated in paragraph (a) plus 5 percent thereof for each kw or part of a kw by which the rating of each range exceeds 12 kw.

(2) For commercial ranges, the demand load shall be determined on the basis of rating and use, and ranges having a rating in excess of 21 kw shall be considered as commercial ranges for this purpose.

(3) The demand loads given in this Rule shall not apply to portable hotplates, rangettes, or other appliances.

4-070 - Branch Circuit Connected Loads.

(1) For show window lighting the size of branch circuit conductors shall be determined on the assumption that not less than 200 watts will be required per lineal foot, measured along the base of the window, except that a lower figure may be used by special permission where circumstances warrant such a reduction.

(2) Where in normal operation the maximum load of a branch circuit will continue for long periods of time, such as store lighting and similar loads, the connected load of such a circuit shall not exceed 80 percent of the circuit capacity.

(3) Branch circuits supplying loads which are not specifically permitted to have a lower demand factor in this or other Sections of this Code shall not be allowed a demand factor of less than 100 percent except by special permission.

REVISIONS TO THE PERMIT REGULATIONS.

Attention of the trade is directed to recent revisions to the Permit Regulations published in the Alberta Gazette under date of May 15th, 1957. (O.C. 718/57).

As a result of these revisions, Clause 31 (g) of the Permit Regulations will read as follows:

> "Permits for electrical work shall be issued only to a person who is the holder of a Permanent Certificate of Proficiency in good standing from the Government of the Province of Alberta entitling the holder to carry out such work within the Province, except in those districts or areas in which licensed electricians are not available, and provided that nothing in these regulations shall prohibit any person from obtaining a permit to carry out personally any electrical work on or within his own residential premises. Transfer from the holder to any other person shall be deemed to have rendered said permit null and void unless written authority for the transfer shall have first been obtained from the Inspection Department."

Hence forth permits for electrical work will not be issued to the holders of Temporary Certificates of Proficiency who are not currently obtaining permits. Those Temporary Certificate holders who are currently being issued with permits should endeavour to make immediate arrangements to obtain Permanent Certificates.

A further revision results in deletion of Clause 38 (b) 6. which means that in future permits will be required for work in those Northern areas of the Province which were previously not covered by the Permit Regulations.